Flexible Technology Company
NITTO DENKO

## Example of VA-type liquid crystal display

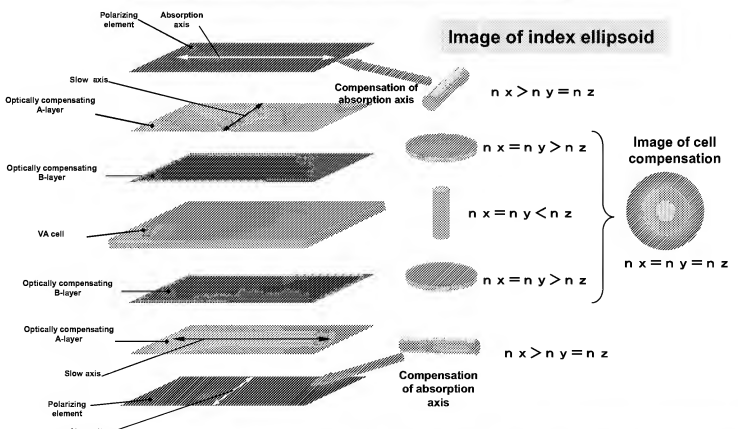


FIG.1

# US6867834B1(Coates, Merck)

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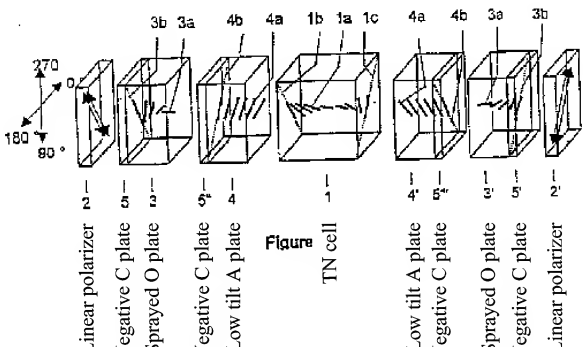


Figure

FIG.2

# Principle of optical compensation of Coates

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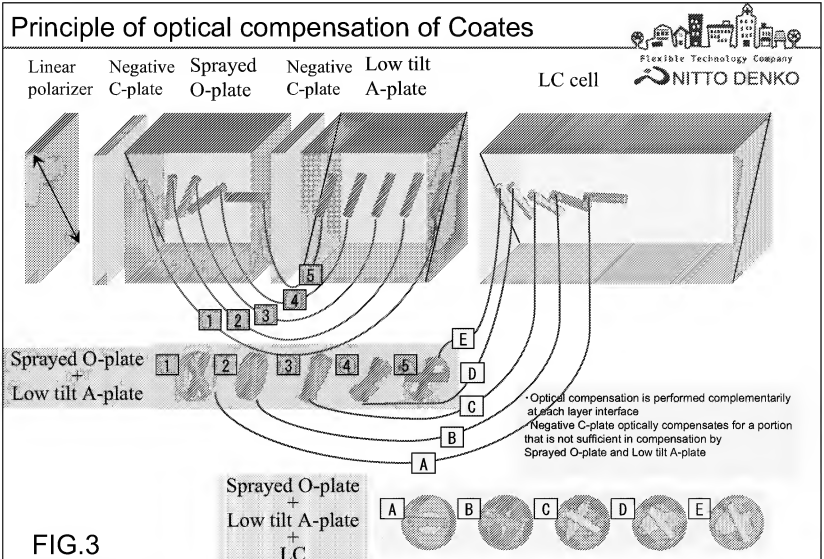


FIG.3

# Principle of optical compensation of Coates


<Introduction>

According to the basic idea of optical compensation, when an index ellipsoid of an optical compensating layer is combined with that of a liquid crystal layer in a cell to form a spherical shape, it is considered that optical compensation is performed effectively. In a VA-mode, a liquid crystal layer is aligned substantially uniformly in a thickness direction, so that optical compensation can be performed satisfactorily with the use of a negative C-plate or a positive A-plate whose alignment is uniform in a thickness direction. On the other hand, in a TN-mode, the alignment of liquid crystal changes in a thickness direction of a liquid crystal layer, so that optical compensation becomes complicated. According to the method of Coates, optical compensation is performed satisfactorily by incorporating a sprayed O-plate in which alignment changes in a thickness direction into a compensating layer.

<Detailed description>

The left half and the right half of a panel have a symmetric structure when twisted by 90° , so that only the left half of the panel will be considered.

The index ellipsoids of a sprayed O-plate, a low tilt A-plate, and cell liquid crystal are combined successively.

(1) Sprayed O-plate + Low tilt A-plate

A sprayed O-plate and a low tilt A-plate are divided in a thickness direction, and the respective divided layers are combined. The respective layers are combined so that the layers closest to an interface between the sprayed O-plate and the low tilt A-plate are combined to be placed on an outer side ([5] in FIG.3), ..., the layers farthest from the interface are combined to be placed on an inner side ([1] in FIG.3). As a result of the combination, a structure is obtained in which the alignment of the disk-shaped index ellipsoids changes in a thickness direction.

(2) Sprayed O-plate + Low tilt A-plate + cell liquid crystal

The structure obtained in (1) is combined with cell liquid crystal. The combination is performed by a method similar to that in (1). As a result of the combination, a structure is obtained in which spherical index ellipsoids are arranged in a thickness direction, which reveals that optical compensation is performed satisfactorily.

(3) Negative C-plate + Sprayed O-plate + Low tilt A-plate + Cell liquid crystal

In the case where the structure obtained in (2) does not have a spherical shape (index ellipsoids in the shape of a Rugby ball are arranged), a structure in which spherical index ellipsoids are arranged is obtained by combining a negative C-plate, whereby optical compensation is performed satisfactorily.

FIG.4